1. (AMENDED) A method of providing synchronized ventilatory support to a patient comprising the steps of:

providing apparatus to deliver ventilatory support to a patient;

determining the patient's instantaneous respiration phase at least in part from both measured respiratory airflow and a signal from a respiratory effort sensor,

calculating a desired pressure value using the determined phase and a desired ventilation pressure amplitude; and

delivering ventilation to said patient in accordance with said desired pressure value.

2. (TWICE AMENDED) The method of claim 1 wherein said respiratory effort sensor is selected from a group of effort sensors that are independent of a leak in airflow that may affect respiratory airflow measurement including:

(a) a suprasternal notch sensor;

(b) an esophageal pressure effort sensor; and

(c) an electromyograph.

3. (AMENDED) The method of claim 41 wherein the phase determining step comprises evaluating fuzzy inference rules relating to said signal from said respiratory effort sensor.

9. (AMENDED) The method of claim 1 wherein the desired ventilation pressure amplitude is varied between a non-zero minimum value and a maximum value.

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11. (AMENDED) The method of claim 4 wherein said fuzzy inference rules include at least one rule selected from a group of rules including:

(a) If the effort signal is zero and increasing fast, then phase is about 0 revolutions;

(b) If the effort signal is medium and increasing moderately, then phase is about 0.2 revolutions;

(c) If the effort signal is large and decreasing fast, then phase is about 0.5 revolutions; and

(d) If the effort signal is medium and decreasing moderately, then phase is about 0.7 revolutions.

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16. (TWICE AMENDED) The method of claim 6 wherein said fuzzy inference rules include at least one rule selected from a group of rules including:

(a) If the airflow is zero and increasing fast, then phase is about 0 revolutions;

(b) If the airflow is large positive and steady, then phase is about 0.25 revolutions;

(c) If the airflow is zero and falling fast, then phase is about 0.5 revolutions;

(d) If the airflow is large negative and steady, then phase is about 0.75 revolutions;

(e) If the airflow is zero and steady and the 5-second low-pass filtered absolute value of the respiratory airflow is large, then phase is about 0.9 revolutions;

(f) If the airflow is positive and the phase is expiratory, then phase is about 0.1 revolutions;

(g) If the airflow is negative and the phase is inspiratory, then phase is about 0.6 revolutions;

(h) If the 5-second low-pass filtered absolute value of the respiratory airflow is small, then phase in the respiratory cycle is increasing at a fixed rate equal to the patient's expected respiratory rate; and

(i) If the 5-second low-pass filtered absolute value of the respiratory airflow is large, then the phase in the respiratory cycle is increasing at a steady rate equal to the existing rate of change of phase, low-pass filtered with a time constant of 20 seconds.

17. (AMENDED) An apparatus for providing synchronized ventilatory support to a patient comprising:

at least one sensor to generate a respiratory effort signal;

at least one sensor to generate a respiratory airflow signal;

a processor in communication with the effort signal and the airflow signal for analyzing both the respiratory airflow signal and the effort signal to determine instantaneous respiratory phase of the patient and to generate a pressure request signal as a function of said instantaneous respiratory phase and a ventilation pressure amplitude; and

a servo-controlled blower to provide pressurized air to said patient in accordance with said pressure request signal.

18. (TWICE AMENDED) The apparatus of claim 42 wherein said at least one sensor is an effort sensor from a group of effort sensors that are independent of a leak in airflow that may affect respiratory airflow measurement including:

(a) a suprasternal notch sensor;

(b) an esophageal pressure effort sensor; and

(c) an electromyograph.

25.(AMENDED) The apparatus of claim 17 wherein the ventilation pressure amplitude is varied between a non-zero minimum value and a maximum value.

26. (AMENDED) The apparatus of claim 25 wherein the generation of said pressure request signal includes deriving an error value that is a function of the difference between calculated patient ventilation and a target value.

27. (AMENDED) The apparatus of claim 20 wherein said fuzzy inference rules include at least one rule selected from a group of rules including:

(a) If the effort signal is zero and increasing fast, then phase is about 0 revolutions;

(b) If the effort signal is medium and increasing moderately, then phase is about 0.2 revolutions;

(c) If the effort signal is large and decreasing fast, then phase is about 0.5 revolutions; and

(d) If the effort signal is medium and decreasing moderately, then phase is about 0.7 revolutions.

32. (TWICE AMENDED) The apparatus of claim 22 wherein said fuzzy inference rules include at least one rule selected form a group of rules including:

(a) If the airflow is zero and increasing fast, then phase is about 0 revolutions;

(b) If the airflow is large positive and steady, then phase is about 0.25 revolutions;

(c) If the airflow is zero and falling fast, then phase is about 0.5 revolutions;

(d) If the airflow is large negative and steady, then phase is about 0.75 revolutions;

(e) If the airflow is zero and steady and the 5-second low-pass filtered absolute value of the respiratory airflow is large, then phase is about 0.9 revolutions;

(f) If the airflow is positive and the phase is expiratory, then phase is about 0.1 revolutions;

(g) If the airflow is negative and the phase is inspiratory, then phase is about 0.6 revolutions;

(h) If the 5-second low-pass filtered absolute value of the respiratory airflow is small, then phase in the respiratory cycle is increasing at a fixed rate equal to the patient's expected respiratory rate; and

(i) If the 5-second low-pass filtered absolute value of the respiratory airflow is large, then phase in the respiratory cycle is increasing at a steady rate equal to the existing rate of change of phase, low-pass filtered with a time constant of 20 seconds.

33. (AMENDED) A method of providing synchronized ventilatory support to a patient comprising the steps of:

providing apparatus for ventilatory support to a patient comprising a flow sensor and a respiratory effort sensor;

determining the patient's instantaneous respiration phase represented as a fraction of a revolution of a respiratory cycle at least in part from a signal from the respiratory effort sensor and a signal from the flow sensor,

calculating a pressure value using the determined phase and a ventilation pressure amplitude; and

delivering ventilation to said patient in accordance with said pressure value.

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34. (TWICE AMENDED) The method of claim 33 wherein said respiratory effort sensor is selected from a group of effort sensors that are independent of a leak in airflow that may affect respiratory airflow measurement including:

(a) a suprasternal notch sensor;

(b) an esophageal pressure effort sensor; and

(c) an electromyograph.

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37. (AMENDED) An apparatus for providing synchronized ventilatory support to a patient comprising:

at least one sensor to generate a respiratory effort signal;

at least one sensor to generate a respiratory airflow signal;

a processor in communication with the effort signal and airflow signal for analyzing both said effort signal and said airflow signal to determine instantaneous respiratory phase of the patient represented as a fraction of a revolution of a respiratory cycle and to generate a desired pressure request signal as a function of said instantaneous respiratory phase and a desired ventilation pressure value; and

a servo-controlled blower to provide pressurized air to said patient in accordance with said pressure request signal.

38. (TWICE AMENDED) The apparatus of claim 37 wherein said at least one sensor is an effort sensor from a group of effort sensors that are independent of a leak in airflow that may affect respiratory airflow measurement including:

(a) a suprasternal notch sensor;

(b) an esophageal pressure effort sensor; and

(c) an electromyograph.

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